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Editorial

PIG DISEASES AND PIG HUSBANDRY

We publish in this issue of The Veterinary Journal a review of the latest work in this country on Diseases of the Pig. There is a definite scarcity of works on this subject, with the result that it is often difficult for veterinary surgeons to know where to look for information concerning the problems they meet in pigs from day to day. The lack of good textbooks dealing with the pig can easily be explained, for the production of works on any subject is usually proportional to the knowledge of the matter concerned. It must be admitted that of all our domestic animals we are less acquainted with the conditions necessary for the maintenance of health and with the diseases associated with domestication in the pig than is the case with the other animals. It is true that concerning some of the commoner infectious diseases our knowledge is fairly extensive. Swine erysipelas, for example, can be said to be understood as far as the cause and prevention are concerned. But even with this disease we still lack accurate information on the conditions under which the causal organism infects and gives rise to the symptoms and lesions associated with the disease.

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Our lack of knowledge, however, concerns mainly what we call for want of a better term "non-specific" diseases, i.e., diseases, the actual causes of which are understood imperfectly or not at all. Concerning some of them the nature of the condition may have been accurately described, but again that only applies to a few. We have still much research work to carry out before the position will be clarified.

As with other types of livestock, the pig has been transferred from its natural surroundings to those of domestication which vary to such an extent that the life of the animal has undergone a complete change. It is necessary for economic reasons to breed, grow and fatten pigs under conditions which will ensure that the maximum result will be obtained in the minimum amount of time. Breeding is carried on out of the normal season; the methods of husbandry of sows is, in many cases, highly artificial; the housing of growing pigs and the feeding of pigs of all ages is now so far removed from those pertaining under natural conditions that it is no surprise that "non-specific" diseases, but little understood, should prevail.

Within recent times a stimulus has been given to the investigation of diseases of pigs in this country, especially those associated with the conditions mentioned above. Progress is being made even under war conditions. It must be pointed out, however, that war conditions themselves give rise to new problems in pig husbandry with consequent disease considerations.

This recently published book is of considerable value to veterinary surgeons, especially those practising in pig-rearing districts. In it will be found not only descriptions of diseases of both the specific and "non-specific" types but much useful knowledge concerning general pig husbandry and feeding. One of its outstanding features is the practical manner in which many of the subjects are treated, reflecting clearly the intimate knowledge possessed by the author, based on his own experience.

General Articles

VITAMIN E AND CONTAGIOUS ABORTION (Br. Abortus Infection) IN CATTLE

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THE following summary is abstracted from the publication, "Vitamins—A Survey of Present Knowledge," 1932, Medical Research Council, and contains a list of feeding stuffs in which vitamin E is present.

Oils and Fats.

Cotton-seed oil +
Hemp-seed oil ++
Lettuce-seed oil +++
Maize-yellow oil +++
Oat-oil, whole oats +++
Palm oil ++
Wheat oil +++
Wheat germ oil +++ (very rich)

Cereals and Cereal Products.

Maize, yellow, embryo +++
Maize grain +
Oats, whole grain +
Rice polished nil to +
Rice polishings +++
Wheat embryo +++
Wheat grain +

Vegetables.

Soya beans +
Coconut press cake +
Lettuce +++
Lettuce, dried +++
Cabbage, green fresh +
Kale ++
Lucerne (Alfalfa), fresh +++
" " dried +++
" " seed +++

Of these the veterinary profession will probably be interested mainly in maize germ oil and wheat germ oil. Farmers, however, will have to consider lucerne, kale, rice bran, maize germ oil and others.

Lucerne is one of the very valuable foods from a vitamin E point of view and can be grown on most deep soils. Maize germ oil appears to be as rich in vitamin E as wheat germ oil and is much cheaper. Rice bran or the first polishings from rice are equally rich in the vitamin and are easily the cheapest source of the vitamin, the price being only from £5 to £7 per ton. The actual cost of the vitamin in this product is nothing because the bran is used as a food.

A very rich natural source of vitamin E is green leaves, spring grass and embryos of seeds. We all know how often cows that have not held to the bull during the winter months will hold soon after being turned out to grass in the spring.

Vitamin E appears to be found in the seeds of any plants that contain it during the growing period. Aftermath probably contains little or no vitamin E, but if the grass is allowed to stand the vitamin will probably be found until the seeds drop out.

It is doubtful if any mare is ever sterile because of lack of vitamin E, for practically every mare is fed on oats together with grass in the spring and summer and therefore unless muscular energy absorbs vitamin E, she must always be well supplied. This may account for the fact that mares do not suffer from contagious abortion due to Br. abortus, although Duff (1937) has shown that agricultural mares often harbour the organism. With the cow, however, a different state prevails. Milk contains varying quantities of vitamin E. It is stated that vitamin E is present in milk and butter, the varying results obtained by different observers being partly due to differences in technique and partly to variations in the samples used. These variations in the samples will depend on the vitamin E content of the diet fed to the cow.

The cow secretes vitamin E in the milk from the vitamin supplied in her food, but the supply decreases with the autumn grasses, and when finally she

is taken into the cow sheds for the winter the amount she then receives may be very small or completely absent owing to the habit the manufacturers have of removing all the essentials from cake, dairy nuts and meals supplied to the farmer. The cow then has to supply the vitamin E secreted in the milk from the amount stored up in her system. This drain goes on until the available amount is finished. Further supplies are not available until she is again turned out to grass.

It has been shown that once the male rat becomes sterile because of lack of vitamin E he remains sterile, but it is believed the same does not apply to the female. Now it is thought that if the process is repeated several times the female rat may also remain sterile. Perhaps this has a bearing on the incidence of sterility in cows.

It is of much importance that experiments should be carried out to ascertain if a comparatively stable quantity of vitamin E would be secreted in the milk if the cow received a sufficient supply of the vitamin in her food all the year round. In fact a considerable amount of research seems to be indicated.

It will be remembered by some of us that Sir John M'Fadyean in 1901 or 1902 carried out an inquiry into contagious abortion, and one of the statements made in his report was: "A cow aborts once, rarely a second time, and practically never a third time." We know that statement would be far from correct now. When that report was issued, however, cows were not being forced for milk to anything like the same extent as they are to-day and they were receiving a great deal more home-grown food. Bran, for example, probably contained a considerable quantity of wheat germ. Crushed oats were frequently used as food for cattle, and lucerne was grown in large quantities and fed in both the green and dry state.

I commenced the following experiments in the summer of 1934 and continued them until June, 1938. In all, 15 herds were involved.

Rangoon rice bran or first polishings were used whenever I could make the necessary arrangements. Farmers were usually willing to purchase this feeding stuffs as part of the food ration, but were not willing to buy maize germ oil which would have been an extra expense.

The *first three herds* belonged to one owner. One of them was kept in this district and numbered about thirty cows; the other two, each of about one hundred cows, were kept in Suffolk. The herds were kept up to strength by bringing in first-calved heifers which nearly always aborted when carrying their second calf. No more abortions occurred in the herd of thirty cows after the feeding of rice bran was started. In the other two herds the incidence of abortion fell to about three each year, whereas before the rice bran was fed there had been about thirty.

Herd 4.H. contained about forty cows and abortion had always been

troublesome. The feeding of rice bran was commenced in May, 1937. During the next year, when the herd was under observation, no abortions took place.

Herd 5.D.—This was a certified herd and was self-contained. There had been five or six abortions each year among the thirty cows. Rice bran was fed and no further abortions occurred for nine months; a further two took place and then another long spell elapsed without further abortions being found. The owner of this herd was somewhat careless and did not feed the rice bran regularly; nevertheless, there was a very big improvement in the abortion rate.

Herd 6.F.—Part of this herd was a flying herd and part was self-contained. The cows numbered one hundred. The treatment was completely successful and the owner always said that it saved him one thousand pounds a year; three hundred would probably have been nearer the correct estimate.

Herd 7.Dra.—This herd contained about sixty cows. Contagious abortion had been prevalent on the farm for many years and finally became so serious that the owner consulted me about vaccination. I advised the feeding of rice bran. Abortions ceased almost immediately afterwards, but unfortunately they occurred amongst a bunch of heifers that were out at grass and, in spite of the feeding of rice bran, the disease ran its course.

The feeding of the bran commenced on July 9, 1935. On February 24, 1936, twelve of the cows were blood tested and re-tested on August 22, 1936. The results were:

Agglutination Titres.

Cow	24/2/36	22/8/36
Mazie	1 : 160	1 : 80
Darkie	1 : 1280	1 : 1280
Kit	1 : 1280	1 : 320
Mabel	1 : 40	1 : 40
Snowball	1 : 1280	1 : 320
Ruby	1 : 1280	1 : 320
Beauty	Nil	Nil
Pansy	1 : 1280	Sold
Strawberry	1 : 320	1 : 80 (doubtful 1 : 160)
Star	1 : 160	1 : 40
Dinah	1 : 20	Nil
Alice	1 : 1280	1 : 1280

Herd 8.P.—This was a herd of about one hundred Guernsey cows and heifers, certified and self-contained. Blood testing and segregation had been tried over a long period and had failed to control abortion. The herd remained free from abortions for a year following the use of rice bran and then

the disease appeared again. On inquiry I found that the owner had left off feeding the bran. Abortions stopped when the feeding of rice bran was again carried out.

Herd 9.H.—This herd of about fifty cows was under observation for six months only, but during that time the owner was well satisfied that the disease had been controlled.

Herd 10.W.—This was a self-contained herd of twenty cows. Vaccination had not been successful in controlling abortion which had been troublesome over a long period. Abortions ceased when rice bran was fed and no further cases occurred until the herd was dispersed about two years later.

Herd 11.S.—In this herd were about forty cows. Abortion had been prevalent ever since I had known the herd, and about June, 1935, I suggested that the owner should try the effect of feeding rice bran. Abortions ceased entirely in the old cows, but an occasional abortion occurs amongst recently purchased first-calved heifers.

Herd 12.V.—This was a self-contained herd of about forty pedigree Guernsey cows and heifers. When the herd was blood tested only two negative reactors were found. In addition to a high incidence in the abortion rate many of the cows would not hold to the bull. The feeding of rice bran was started on July 15, 1935. The abortions were got under control, but the failure to breed was as bad as ever.

Herd 13.B.—In this self-contained, tuberculin-tested herd there were about thirty cows. The owner was always willing to start something new, but would not persevere with any form of treatment. Unfortunately he started feeding rice meal instead of rice bran. It was found, however, that when the bran was used there was a definite improvement, but the supply of bran was never kept up.

Herd 14.W.—There were about twenty cows in this herd which latterly was self-contained. There was an incidence of from three to four abortions every year. The feeding of bran was started in 1936. No further abortions have occurred up to the present time.

Herd 15.Gl.—Previous to June, 1934, six blood tests had been made and at each test there was a high incidence of positive reactions. Between June, 1934, and October, 1934, six cows aborted. In October rice bran was fed to all the cows. No abortions occurred for at least a year. During the following years only an occasional abortion was found. On two occasions the old cow Brownie aborted. The owner was so satisfied that he continued the bran up to the commencement of the war with excellent results. In this case I am able to give the results of agglutination tests carried out between October 20, 1935, and April 8, 1937.

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	Agglutination Titres.			
Cow	20/10/35	8/5/36	18/11/36	8/4/37
Buttercup	1 : 10	Nil	1 : 10	Nil
Snowflake	Nil	Nil	1 : 10	Nil
Mab	Nil	Nil	Nil	Nil
Edith	1 : 640	1 : 640	1 : 640	1 : 320
Bunty	Nil	Nil	1 : 10	Nil
Mabel	1 : 10	1 : 20	1 : 10	Nil
Greta	Nil	Nil	1 : 10	Nil
Prudence	1 : 40	1 : 80	1 : 40	1 : 160
Patience	1 : 20	Nil	1 : 20	1 : 20
Harebell	1 : 10	Nil	1 : 10	1 : 10
Beauty	1 : 10	Nil	1 : 10	Nil
Rachel	1 : 10	1 : 10	1 : 10	1 : 10
Maude	1 : 10	Nil	1 : 10	Nil
Pansy	1 : 80	1 : 40	1 : 20	1 : 20
Daisy	Nil	Nil	Nil	1 : 10
Brownie	1 : 1280	1 : 160	1 : 1280	1 : 160
Cowslip	Nil	Nil	Nil	Nil
Rusty		Nil	1 : 10	1 : 10
Pearl		1 : 20	1 : 10	1 : 20
Petal		Nil	1 : 10	Nil
Moon		1 : 80	1 : 40	1 : 40
Gem		Nil	Nil	Nil
Jewel		Nil	1 : 10	Nil
Bell		Nil	1 : 10	Nil
Jolly 2nd			1 : 10	Nil
Brenda			1 : 10	Nil
Crystal			1 : 10	1 : 40
Bess			1 : 10	Nil
Heather			1 : 10	Nil
Rose			Nil	Nil
Marigold				Nil
Polly				Nil
Bluebell				Nil

It was unfortunate that I was unable to have agglutination tests carried out in this herd before the bran was started, but some of the titres must have been very high as shown by previous tests and owing to the fact that six cows had only recently aborted.

Rice bran has always been considered a poor food for dairy cows and according to the farmers with whom I have discussed it, was said by the travellers never to be included in cakes and dairy nuts. When the farmers

began to talk about the benefits obtained from rice bran, however, the travellers immediately claimed that their own special compounds contained it. There seems to be no doubt that when this product was cheap enough it was bought by the shipload and used in the manufacture of cakes, nuts, etc. This may account for the sudden cessation of abortion one so often sees in different herds. The quantity of rice bran that should be fed to cows is two lb. per day and it should be fed to in-calf heifers at grass if possible, because although there may be vitamin E in the grass, it is wise to give an extra supply.

Now that it is almost impossible to get rice bran, maize oil will have to be used. Although I have not used this in the treatment of abortion I have used it a great deal in the treatment of sterility, with much success. The dose has been 2 oz. every three weeks sprinkled over the food. It would appear to be quite safe to give this quantity over a prolonged period because vitamin E does not appear to cause any harm even if fed in excess. If lettuce is fed to poultry, even in enormous quantities, it has no ill effects.

The agglutination tests were carried out by Professor T. Dalling to whom my thanks are due for this service and for the advice he gave me in carrying out these experiments.

I should like to acknowledge my indebtedness to Messrs. White, Tomkins and Courage, Ltd., London, E.C.3, for kindly supplying me with the maize oil.

REFERENCE

Duff, H. M. (1937): *J. Comp. Path. & Therap., 50,* 151.

URINE PREGNANCY TEST IN ANIMALS

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I—A Review of the Literature

SIMMONET (1931) reported that the intravenous injection of an extract of the posterior lobe of the hypophysis into a pregnant animal causes diagnostic uterine contractions when the uterus is palpable and that the contractions are too slight to affect the fœtus adversely.

Karman and Z'enobie (1931) inoculated urine from pregnant women into immature female mice whose ovaries reacted in four days. They attributed

this result to the presence of a secretion of the anterior lobe of the pituitary gland.

Wallen-Lawrence and Dyke (1931) investigated the potency and stability of pituitary implants and extracts, as well as the difference between extracts of the anterior pituitary lobe and the urine in pregnancy. They used the term "hebin" as being synonymous with the active principle. Immature rats were used and quantitative evaluation of the potency of the extracts was based primarily on the weights of both ovaries after subcutaneous injection of extracts. They did not rely on impressions of follicular maturation and luteinisation. In the case of males, the weights of the seminal vesicles were used.

Following intraperitoneal implants of fresh rat pituitaries (to determine the stability of hebin), activity was retained after keeping for 24 hours in a moist atmosphere at 4 deg. C., but was destroyed after freezing for 9 to 36 days.

Extracts of fresh rat pituitaries made by placing them in 70 per cent. alcohol followed by grinding the suspension and then placing the residue in m/5 sodium acetate-acetic acid buffer, pH 4.5, showed that 1 c.c. of the buffer extract was equivalent to 25 g. of the fresh gland. The extract was still active after standing for two months at pH 4.5. Attempts to extract hebin from fresh ox anterior lobe by this method produced negative results, while with sheep glands the results were positive. Pig pituitary glands were found to be superior to those of the ox as a source of the hormone. Sheep pituitary hebin did not pass through parchment or collodion membranes and the extract was stable at 60 deg. C. for one hour and after boiling.

Urinary hebin was destroyed by boiling and was partially injured when kept at 60 deg. C. for one hour. The authors do not support the theory that both the anterior lobe pituitary and pregnancy urine contain two substances affecting the ovary (one causing follicular maturation, the other luteinisation) and they could not distinguish between the effects of rat and sheep pituitaries and pregnancy urine.

Becker (1932) modified the Ascheim-Zondek technique by diluting the urine from mares with an equal volume of normal saline and injecting from 0.6 to 1.2 c.c. into immature female mice. In the original A-Z method pregnancy was diagnosed on the 49th day, while Becker was able to make a diagnosis on the 42nd day.

Kust (1931) noted that the A-Z reaction has no significance in relation to the common domestic animals, though he admitted that the ovarian hormone is excreted in the urine of some animals. He inoculated the urine or blood serum of mares into immature female white mice and examined the vaginal secretion and noted characteristic changes. He also reported that the urine of pregnant cattle does not contain the hormone with sufficient regularity to

be applicable in practice for the diagnosis of pregnancy. In mares, Kust claimed 100 per cent. success, pregnancy being recognisable from the 30th day after conception in many cases and with certainty from the 42nd day. The author failed to demonstrate the hormone in the urine of pregnant bitches, goats, swine and cattle.

Armstrong and Walker (1932) attributed the positive Knoop's test in pregnancy urine to histidine because the only substance found to give such a reaction is N-methyl histidine. They did not express an opinion as to the diagnostic value of the test.

Asdell and Masden (1933) reported that the Zondek and Friedmann tests were both negative in pregnant cows and goats, but Friedmann's test was positive in the mare (using blood serum) from the 50th to the 100th day of pregnancy.

Kust (1932) found that the use of untreated urine and infantile white mice was more reliable than when treated with ether and injected into white rats. Positive results were also found in mares in œstrum or suffering from ovarian disease. The author prefers the use of blood serum to urine.

Langlotz (1932) applied Kust's technique to determine whether the ovarian hormone is excreted in the urine of pregnant cows. He found that, using urine treated with ether, positive results were obtained from the 23rd week of gestation, whilst with pure urine positive results were observed from the 29th week.

Van der Kaag (1933), using the test to ascertain the presence of follicular hormone in mares, demonstrated with certainty the presence of pregnancy in 98 per cent. of cases by the ninth week of gestation, and the author stated that good results were obtained when castrated mice were used as test animals.

Hart and Cole found that the blood could be used as the test material for evidence of follicular hormone, the existence of pregnancy being demonstrable from the fifth to sixth week up to parturition. The hormone was present in maximum quantity about the 80th day. The tests are less valuable in cattle and pigs, and even less so in dogs.

Courrier and Kehl (1933) record experiments on gestation in the rabbit in which, after the removal of the ovaries, normal sequelæ to pregnancy were obtained by the administration of an extract of corpus luteum on or after the 21st day.

A number of workers have found that the removal of the ovaries before the end of gestation results in abortion.

Fiore (1933) followed Manoiloff's technique (0.3 c.c. of a 2 per cent. solution of diuretin and a drop of 0.2 per cent. Nile blue solution mixed together and observing the colour reaction which appears from a few minutes to a few hours after the solution has been mixed). The test was applied to 150 non-pregnant and 20 pregnant cows as well as to pregnant and non-

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pregnant sheep and goats and to bulls, bullocks and rams. From his results the author concluded that the method is of no practical value as positive and negative results were observed in both pregnant and non-pregnant animals and in male animals; doubtful reactions also occur.

Karman and Wiethoff (1933) reported that, judging from their experiments, pregnancy in mares can always be ascertained by the detection of the ovarian hormone in the urine as shown by the results following the injection into female white mice. By using blood serum from the mare instead of urine the experiments become less costly, more easily carried out and more reliable; pregnancy can also be detected earlier. The examination of eight pregnant mares by the two tests showed that with the serum test pregnancy could be diagnosed at the 43rd-51st days as compared with the 43rd-100th days with the urine test.

Papi (1933) obtained urine from a heifer and from two pregnant cows. One hundred c.c. of filtered acidified urine from each was injected intravenously into three young rabbits. After 72 hours the rabbits were killed. The animals which had received the urine from the pregnant cows showed small hæmorrhages in the ovaries, an increase in the size of the Graafian follicles and hyperæmia of the uterus. (The hormones, prolan A and B, are thought to be primarily responsible for producing these effects.) The urine from the heifer produced no changes. On repeating this work by injecting the urine subcutaneously, hyperæmia of the uterus was much more pronounced than in the first case.

Girard (1933) pointed out that the lutein cannot exert its characteristic action on the endometrium unless the uterus has first been subjected to the action of œstrin (folliculin). The hormones secreted by the ovary are influenced by the hormones, prolan A and B, secreted by the pituitary body. Prolan A produces ripening of the follicle and prolan B produces atresia of the follicle and the development of the corpus luteum. They are of the nature of polypeptides. Œstrin can be obtained directly from the urine of pregnant women, but urine from pregnant mares must first be hydrolysed before the active œstrogenic substance is obtained. The hormone present in the urine of pregnant mares shows constant physical differences from that in the urine of pregnant women. The author isolated a new substance, equilin $C_{18}H_{20}O_2$, from the urine of pregnant mares which forms a large proportion of the total hormones present in the urine and resembles œstrin in action.

Evans, Gustus and Simpson (1933) succeeded in isolating the gonadotropic hormone present in the blood serum of pregnant mares by adsorbing it on to aluminium hydroxide. The hormone was thus obtained in a concentrated form and its action was demonstrated on immature male rats, in which it caused an intense activity of the genital organs.

Becker (1934), for early diagnosis, found the use of blood of mares more

reliable than urine and the blood test always gave an accurate result by the sixth week of gestation.

Kust (1933) states that the anterior hypophyseal hormones are present in the blood of pregnant mares from the 40th day with certainty and are absent after six months. The ovarian hormone, on the other hand, begins to be excreted in the urine at mid-gestation and is present in large quantities till parturition.

Blood is therefore tested for pituitary hormone between the 40th and 150th days of gestation and urine for the ovarian hormone after that period.

Kust and Struck (1934), on examination of the urine of pregnant sows, found that from the 24th to the 32nd day of gestation, 1,000 to 2,000 mouse units of œstrin per litre of urine are excreted. Previous to and after this period no hormone can be detected in the urine until the 11th to the 12th week of pregnancy, when 1,000 to 4,000 mouse units per litre are excreted. Shortly before parturition the amount excreted falls rapidly and disappears a few days later. At no time during pregnancy was œstrin demonstrated in the blood, nor could prolan be demonstrated in the blood or urine.

Dodds (1934) considered that the anterior lobe of the pituitary produces: (1) growth hormone; (2) prolan (A and B); (3) thyrotropic hormone; (4) parathyrotropic hormone. The main functions of prolan are to initiate the maturation of the follicle and the formation of the corpus luteum, and also to stimulate the testes to produce the male sex hormone. The ovaries having been stimulated by prolan, in their turn, elaborate œstrin. Similarly, the thyrotropic hormone stimulates the thyroid to produce thyroxine. Until the exact point of action of the various hormones can be determined, it is impossible to have a complete understanding of the changes which they produce in the animal body.

Magnusson (1934) employed the modified Ascheim-Zondek test, using mice and the Friedmann-Schneider test, using rabbits to diagnose pregnancy in 140 mares by means of their blood serum. The error percentage was only 1-6 with samples obtained between the sixth and tenth weeks of gestation.

Martensson (1934), using the same test as Magnusson, obtained 100 per cent. accuracy with 53 mares and found that the rabbit test has the advantage of yielding more rapid results.

Remlinger and Bailly (1934),[1] using Friedmann's technique for the diagnosis of pregnancy in human patients, examined urine from pregnant cows, sows, goats, rabbits and guinea-pigs and they consider that the method is of no value for the diagnosis of pregnancy in domestic animals.

Using the same technique as before, the same authors (1934)[2] examined the urine and serum from pregnant mares and donkeys with negative results.

Cuboni (1934) has attempted to evolve a simple method which might be easily carried out in practice. Five c.c. of filtered urine is mixed with 1 c.c.

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concentrated HCl, heated for ten minutes on a water bath at 100 deg. C. and cooled; 6 c.c. of benzine is added and the solution is shaken to separate; 1 c.c. concentrated sulphuric acid is added to the extract and the mixture placed on a water bath at 70 to 90 deg. C. for a few minutes, shaken repeatedly and allowed to cool. If the reaction is negative, a reddish brown colour is produced; if positive, a fluorescent-green colour appears. One hundred and ten non-pregnant mares and four stallions gave negative reactions, whilst 43 mares which were proved to be pregnant by clinical examinations and biological tests gave positive results.

Bruhn (1933), inoculating urine from pregnant cows into immature mice, found that up to the end of the 16th week of pregnancy no œstrin was present in the urine. From the end of the 17th week until the 22nd week a variable amount is present, and from the 22nd week to the end of the fifth month the amount is 800 to 1,600 mouse units per litre. After the fifth month the amount of œstrin drops to about 800 units per litre and remains at this level until parturition. Prolan was never found in the urine, nor were sex hormones found in the blood serum, saliva, milk or fæces. In non-pregnant animals with ovarian cysts, no sex hormones were found in any of the excretions or secretions.

Kust and Vogt (1934) injected samples of blood and urine from three pregnant ewes and a ewe which had aborted into series of immature mice and rats. In no case was a reaction observed which suggested the presence of sex hormones.

Butendant (1934) stated that the present state of knowledge shows that the internal secretion of the anterior pituitary is of great importance, for without this secretion the reproductive glands of both sexes will not function properly. It has been suggested that the anterior pituitary secretes two hormones, prolan A and B, but these have not been isolated separately and recent experiments indicate that the question may be one of the amount of prolan circulating in the blood stream. The physiologically active substances obtained from the urine of pregnant animals are probably of placental origin. A crystalline substance, $C_{20}H_{28}O_2$, has been isolated from the corpus luteum, 0.75 mg. of which produces proliferation of the uterine mucosa in immature rabbits. This substance is considered to be the active principle of the corpus luteum.

Martensson (1935) reported that the Friedmann-Schneider biological method of pregnancy diagnosis proved reliable in 88 per cent. of 102 mares tested between the 49th and 84th days of gestation.

Miller (1934) states that the diagnosis of pregnancy in mares depends upon the demonstration of œstrin in their urine and is recognised by the injection of urine samples into mice.

The mice used for the test are oophorectomised when three or four weeks old and are injected three weeks later. To reduce the mortality amongst the

test mice, alkaline urine is acidified with sulpho-salicylic acid, neutralised and filtered before injection. The number of injections given to the mice depends on the period of pregnancy of the mare.

Thirty-six hours after the last injection vaginal smears are made from the test mice and treated with giemsa which stains cornified cells a brilliant blue. If the cells are characteristic of a normal diosestrus the result is negative.

The error of the test is 1.08 per cent.

Greenwood and Blyth (1934), using fowls for the test, state that the female Brown Leghorn possesses salmon-coloured breast feathers whilst these are black in the male, and it has been shown that the characteristic female plumage is produced and maintained by ovarian influence, whereas the male plumage is not affected by the testes. It has also been shown that a single injection of œstrin into Brown Leghorn capons produces a change in colour of the growing breast feathers in 48 hours and this fact forms the basis of the test here described.

When feathers become pigmented they are unaffected by œstrin and capons are used for the test as they have the faculty of renewing rapidly plucked feathers. About a dozen feathers are removed from the breast and about seven days later, when young growing feathers can be seen pressing the skin outwards, 10 c.c. of prepared urine is injected into the pectoral muscles on two consecutive days. Three days later a few feathers are removed for microscopic examination. If the urine contains œstrin, red pigment is present at the base of the feathers. The results so far obtained agree very closely with those produced by the mouse test.

Robson (1936) indicates that œstrone excreted during pregnancy in women is present in physiologically active and inactive forms. Although the total amount of œstrone excreted rises during pregnancy, the amount of physiologically active hormone remains low but rises immediately after parturition. The form in which œstrin is excreted by pregnant mares has not yet been established, but it is known that œstrin production is largely independent of ovarian activity, and unlike the case in women, it is present in the blood in comparatively small amounts. On the other hand, large amounts of gonadotropic hormone appear in the blood of mares from about the 40th to the 50th days and disappear after the 90th to the 100th days, after which the corpora lutea regress. It appears certain that the hormonic control of pregnancy is not identical in all types of animal, but there are essential factors common to all.

Theobald (1936) suggests that the centre for supplying hormones is stimulated both by the ovarian hormones and by nerve impulses from the generative organs and from higher brain centres. The afferent stimuli are provided by the ovarian hormones, generative organs and cerebral cortex and the efferent stimuli from the centre operated through the anterior pituitary

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gland and, to a certain extent, through the generative organs themselves.

Arnold (1935) examined the ovaries of sexually mature virgin rabbits for the presence of corpora hæmorrhagica 18 hours after the rabbits had received intravenous injections of 0.5 to 5 c.c. of serum from the mares to be tested. It was found that doses of 0.5 c.c. of serum did not give consistent results and that in only three out of 16 tests were the results wrong when a large amount of serum had been used. The test may not give positive results until the 47th day after conception but appears to be reliable until the 82nd day.

Crew (1936), using Friedmann's test and at the same time carrying out a confirmatory Ascheim-Zondek test, claimed that the error in the diagnosis of human pregnancy is not greater than 1.5 per cent. Errors appear more frequently at the beginning and end of the reproductive phase of life. There is as yet no satisfactory explanation for the fact that in some cases injections of urine kill the test animals. Precipitation of the excess of protein by means of hydrochloric acid has in a number of cases reduced the lethal quality of the urine.

Karmann (1936) compared the results obtained by the mouse test and by Cuboni's chemical test for the diagnosis of pregnancy in mares. Two hundred samples of urine were examined and only in one case did the results of the two tests differ. Cuboni's test appears to be satisfactory for the diagnosis of pregnancy after the 120th day of gestation. It possesses the advantage of being carried out more easily and quickly than either the Allen-Doisy or Ascheim-Zondek tests, and since no animals are used the sources of experimental error are reduced.

The Equine Pregnancy Diagnosis Service (1935) tested over 2,000 samples of urine during 1935 and only 48 were doubtful at the first test; on re-testing with a second sample of urine a definite result was usually obtained. During the early part of the season a considerable number of pregnant mares from about the 55th to the 80th day after service gave weak positive reactions. This is considered to be due to the exceptionally dry summer. The majority of mares do not excrete a sufficient amount of œstrin in their urine to enable the test to be reliable until after the 60th day of pregnancy. It has been shown recently that the Brown Leghorn capon may be used as a test animal as the mouse. In this case, on injection of equine urine containing œstrin, the growing breast feathers change from black to a salmon colour. Blood serum can also be used to determine pregnancy from the 40th day after service.

Stalfors and Hoflund (1934) conclude that the original Ascheim-Zondek reaction is of little value for diagnosis in animals and have, therefore, carried out further experiments with the ovarian hormone, œstrin, either as it occurs in blood serum or in urine. Samples of urine from 12 served mares and cows were examined and the authors state that with urine from served cows the ovarian hormone was not demonstrable until after the fifth month of pregnancy.

Grini (1935) speaks highly of the convenience of Friedmann-Schneider pregnancy diagnosis method following tests of blood serum of 38 mares, and declares it to be as reliable as the Ascheim-Zondek test.

Struck (1935) showed that œstrin in the pig is excreted in the urine about the 15th day of pregnancy. It disappears from the urine immediately after parturition.

Petrych (1936) suggested that in cows at a gestation period later than the 16th day the intravenous injection of pituitary extract provokes a uterine contraction palpable in the rectum within two minutes.

Anderson (1936) used ovariectomised mice and urine treated with sulphosalicylic acid in order to detoxicate it and to precipitate any protein. Complete cornification of the vaginal cell contents is regarded as a positive result.

For a positive result more than 1,000 mouse units of œstrone per litre of urine must be present. This amount is usually present in pregnant mares by about the 60th to the 65th day.

Svensson (1937) tested 1,659 mares for pregnancy, using the Ascheim-Zondek test; 1,002 gave positive and 657 negative reactions; the fewest errors occurred when the test was performed between the 59th and the 65th days after service; the test was found very reliable between the 50th and the 86th days.

Two blood samples taken from pregnant mares and stored at 10 deg. C. for 250 days still gave positive A-Z reactions.

Barulin and Burcènko (1935) investigated the variation in the vaginal picture of the mare throughout the sexual cycle and found that vaginal smears are not a reliable indication of œstrus. On the other hand, smears from pregnant mares are very characteristic, showing numerous ciliated epithelial cells or their debris, while the mucus forms intensely pigmented globules. These two symptoms are reported by the authors to be reliable signs of pregnancy.

Dau (1937) diagnosed pregnancy in mares after treating the urine with ether and heating it to decrease toxicity. The rat is a better test animal than the mouse and serum is preferred to urine.

II—Experimental Work

(*a*) *Introduction.*

The object of this work is to find a ***simple*** method to diagnose pregnancy at the ***earliest*** period possible so that a season will not be wasted.

Experiments were commenced in 1935. Urine from women, mares, cows, buffaloes and bitches was tested.

Female rabbits, mature but virgin, were found the most reliable and for

accuracy young rabbits must be brought up each in a separate place until they are at least two months old before intraperitoneal inoculation.

Urine is easy to obtain and *no* catheter is needed. Ether or chloroform added to urine in ¼ to ½ per cent. and left to act for 12-24 hours before inoculation is sufficient to reduce toxicity and destroy contaminating organisms. At the same time they have no destructive effect on the hormones that may be present. Urine treated with ether retains any hormones for several months whether kept at room or ice-chest temperatures.

Egyptian-bred rabbits are less sensitive to hormones than European-bred ones. Two successive inoculations are necessary.

Diagnosis by the following method can be made seven days after the last menstruation in women, two to three weeks after serving in mares, cows, buffaloes and bitches, but in pregnant women the hormone in the urine affects mainly the *ovaries* of the inoculated rabbit while in the other animals mentioned the hormone present in the urine during the early period of pregnancy produces *no* naked eye changes in the ovaries but ***has a distinct and prominent effect on the uterus of the inoculated rabbit.*** The uterus and its horns become greatly thickened (five to ten times the normal thickness) and the horns assume a coiled appearance.

(*b*) *Method Adopted.*

Female mature but virgin rabbits (kept separate and away from males after weaning) are intraperitoneally inoculated on two successive days with the urine to be tested, 12 to 24 hours after the addition of ether. Ether was found more suitable than chloroform. To 50 c.c. urine, nine drops of ether were added.

First dose, 8 c.c.; second dose, 10 c.c. On the third day, 24 hours after the second injection, the rabbit is killed by bleeding and a post-mortem examination is made.

(*c*) *Experiments.*

Urine from Women.—Twenty-five samples of urine collected from women. Ten samples taken 15 days after last menstruation, seven proved positive and three negative, and 15 samples, collected at various stages of late pregnancy and to the seventh month, all proved positive by inoculation.

A positive result is indicated by the occurrence of congestion of the rabbit's ovaries which contained three or four macroscopic hæmorrhages about 2-4 mm. in diameter, giving the ovaries a mulberry appearance (see photograph 1). The uterus is fairly congested and enlarged, but the naked eye appearance of the ovaries is diagnostic.

The history of these cases was followed and was found to be in agreement with the inoculation results.

Urine from Mares.—Sample were collected from mares after being served at the Veterinary Service Infirmary at Giza and the history of cases was followed.

Thirty samples were collected: (1) 15, two weeks after service; (2) 5, two months after serving; (3) 10, at various stages between the fifth and eighth month of pregnancy.

(1) The results of the tests showed that nine of the mares were pregnant and six not pregnant. The latter were re-served 40 days later and when the urines were again tested, four positive and two negative results were obtained. The subsequent histories of the mares showed that the tests were correct.

In all the positive cases the rabbits' ovaries showed no macroscopic changes while the uteri and horns were distinctly thickened, coiled and congested.

(2) Of the five cases tested by urine inoculation two months after serving, four proved pregnant and one non-pregnant. The non-pregnant case was examined by rectal manipulation and proved empty. Again in the positive cases the rabbits' ovaries showed no naked eye changes but uteri and horns were markedly enlarged, coiled and congested.

(3) The ten cases were proved, by rectal manipulation, to be pregnant and in each case following the inoculation of urine into rabbits there was found marked thickened and coiled uteri and horns as well as congested and hæmorrhagic ovaries.

Urine from Cows.—Ten samples of urine were obtained from pregnant cows at the Higher College of Agriculture, Giza, five samples 20 days after serving and five during the later months of pregnancy. Five samples of urine from heifers were also obtained through the courtesy of the veterinary staff of the Faculty of Agriculture.

The inoculation results agreed with the clinical and history results and, as in mares during the early period of pregnancy, only the uteri and horns of the injected rabbits showed significant changes, while the ovaries also showed changes during later stages of pregnancy.

Urine from Buffaloes.—Twelve samples of urine were obtained from buffaloes on two different farms at Mattaria, near Cairo. Three samples were obtained three weeks after service and nine samples at various stages between the second and seventh month of pregnancy.

Inoculation results were similar to those of mares and cows, that is to say the hormone in the urine of pregnant animals in early stages of pregnancy has no macroscopic effect on rabbits' ovaries, but causes marked thickening and coiling of uteri.

Urine from Bitches.—Urine from three pregnant bitches was obtained from the Cairo Zoo about a month after service and on inoculation into rabbits

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the uteri showed marked thickening and coiling, while in the ovaries there were no naked eye changes.

All the results of the inoculation of urine into rabbits corresponded with the subsequent histories of pregnancy.

Discussion and Summary

The experiments show that in virgin mature rabbits, into which the urine of pregnant females is injected, a diagnostic reaction is produced. The reaction is found in the ovaries and the uterus, including the horns, and varies somewhat, depending on the animal from which the urine was obtained and the stage of pregnancy. In the human female the ovaries of the injected rabbit are mostly involved; they are congested and contain hæmorrhagic areas. In the other animals tested (mare, cow, buffalo and bitch) the outstanding feature is the thickening of the uterus including the horns, which assume a coiled appearance as opposed to their normal straight condition. The two changes are illustrated in the accompanying photographs. For the test, Belgian or British rabbits were found more sensitive than Egyptian rabbits and mature virgin females produced much better results than those which were immature. Two lots of urine—each 8 and 10 c.c., injected intraperitoneally on two successive days—are necessary with the Egyptian rabbits, while a single injection of 12-15 c.c. was sufficient with the other breeds. The hormones in the urine are not adversely affected by the addition of 0.5 per cent. ether, and urine so treated may be kept at room temperature for three months and in the ice-chest for at least six months. A concentration of ether in excess of 0.5 per cent. should not be used because of its irritant action when injected into the rabbit. The addition of ether is essential if urine for testing has to be kept even in the ice-chest for more than ten days.

The experiments indicate that by this method of testing, pregnancy can be diagnosed two weeks after service.

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FIG. 1.—Positive human urine.

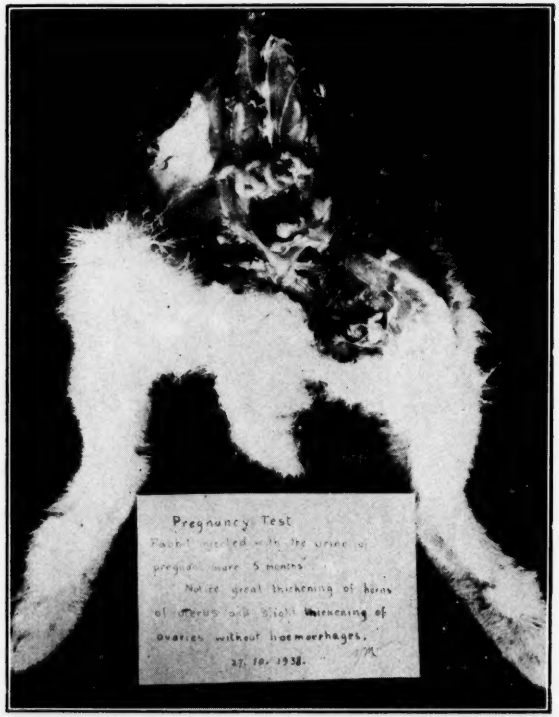

FIG. 2.—Pregnancy Test. Rabbit injected with the urine of pregnant mare " 5 months. Notice great thickening of horns of uterus and slight thickening of ovaries without hæmorrhages.

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THE WILLOW WOOD WASP AND WATER-MARK DISEASE OF WILLOWS

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WATERMARK DISEASE OF WILLOWS has recently become a serious problem to the cricket bat industry of East Anglia. A peculiar and characteristic stain resembling a watermark appears in the wood, and small twigs at the top of the tree die. Subsequently the whole tree "dies back" over a period of two years or longer.

The causal organism was first isolated by W. R. Day during 1922-24. It is called the Bacterium Salicis Day, and is described as a small gram negative, non-sporing, flagellate round-ended rod, which prefers an acid medium and grows slowly on artificial media. Thin and almost transparent colonies appear on beef infusion agar plates within two to three days, and on glucose agar in from four to five days. Colonies growing on maize meal agar and on potato agar containing 0.5 per cent. starch produce a characteristic yellow pigment which diffuses into the media. It is most marked in colonies grown on autoclaved potato plugs, the first grey slimy growth turning rapidly to a bright yellow pigment, regarded as diagnostic.

Day's original observations have been confirmed and extended by W. J. Dowson, who found that there were two closely allied strains of the organism.

Various insects live in and about willows, and the question of vectors has therefore arisen. The willow midge and willow saw fly are found amongst the young shoots at the top of the tree where the first signs of the infection appear, but attempts to prove they are vectors have not been successful.

W. H. Goddard, Chief Inspector of Willows for Essex, found the willow wood wasp repeatedly present in and about diseased and healthy willows, and noted that it laid its eggs by means of an ovipositor beneath the bark. In an endeavour to confirm suspicions that this insect might be a vector the facilities of the pathological laboratory of the veterinary department were sought, and during the summer of 1938 a series of investigations carried out.

Potato glucose agar plates and autoclaved potato plugs were prepared according to the formula of W. J. Dowson, and beef infusion agar plates adjusted to the required Ph 6.5.

Some plates and potato plugs were first inoculated with sap from a patch of watermarked wood in a living diseased pollard willow at the Institute farm, and incubated at 30 deg. Centrigrade. Between forty-eight and fifty-six hours later a brown slimy growth appeared on the potato plugs, which during the next two days assumed a bright yellow colour. Small discrete transparent colonies appeared in three days on the potato glucose plates. A hanging drop

preparation from the growth on the potato plugs revealed numerous small motile round-ended bacilli, found by staining to be gram negative.

A male willow wood wasp from a neighbouring willow trunk, felled because it was diseased with watermark, was then dissected and the contents of its intestine plated on a beef infusion plate of Ph 6.5 and on potato plugs.

Signs of growth were visible on the plate at the end of twenty-four hours, and a brown slimy influorescent growth appeared on the potato plugs at the end of forty-eight hours. Small clear discrete colonies were present on the plate at the end of three days.

It appeared therefore that the same organism was present in both the living tree and the one felled, and that it could be isolated from the gut of an insect feeding on diseased wood.

Male and female willow wood wasps, collected from healthy trees, were then placed in a small cage on a section of diseased branch from the first tree, i.e., the one infected but not cut down.

After four days two females were dissected, and cultures made from their intestinal contents and ovaries on autoclaved potato plugs and on potato agar plates. The ovaries were dissected out entire, and washed in three successive lots of distilled water, after which they were emulsified in fresh distilled water on a sterile hollow ground slide with sterile needles.

After forty-eight hours' incubation at 30 deg. Centigrade a brown slimy growth had appeared on the potato plugs, and numerous small clear discrete colonies were seen on the plates, from both the intestines and the ovaries.

Some larvæ and pupæ were then obtained from the felled trunk. From these grubs the cœlomic fluid was withdrawn by means of fine sharp pipettes, and pipetted over beef infusion plates, potato glucose plates, and autoclaved potato plugs.

The intestinal contents were also inoculated on the same three varieties of media.

Small clear colonies began to appear on the plates at the end of forty-eight hours, and a brown slimy growth was established on the potato plugs at the end of the same time.

Examination by staining and hanging drop preparation of the plate colonies and of those on the potato plugs revealed numerous small gram negative, motile, round-ended bacilli.

The same organism, together with a considerable number of contaminants, was also isolated from the cœlomic fluid and gut contents of a goat moth larva found in the wood of the living diseased pollard willow. Since the larva constructs tunnels by biting and swallowing rotten or softened wood, unlike the willow wood wasp which feeds almost exclusively on sap, the appearance of contaminants was to be expected.

After several more days the wasps in the cage containing a diseased willow

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branch were removed to a second cage containing a healthy section of willow branch. This branch had not the appearance of watermark, nor were attempts to isolate the organism from it in any way successful. The wasps were watched, and were seen to feed on the branch; the females also laid eggs by means of their ovipositors.

Four days later the females were removed from the second cage and dissected. The same cultural isolation procedure was followed, and the organism was again successfully isolated from the cœlomic fluid, the gut, and crushed extracts of the ovaries. In order so far as possible to rule out the presence of the organism from the supporting and enveloping tissues of the ovary, one ovary was left for thirty hours in chloroform before it was emulsified and cultures taken from it. A single egg was also selected, and after repeated washing in successive lots of distilled water, crushed and inoculated on potato plugs and potato glucose agar plates. In both these instances the characteristic growth appeared within two to three days on the plates and the potato plugs. Examination of these colonies by staining and hanging drop preparation revealed small gram negative motile round-ended bacilli.

Another (male) wasp from the same cage was allowed to walk over a beef infusion plate. A profuse growth of contaminants resulted, but amongst them were small clear discrete colonies.

The piece of healthy branch was afterwards carefully examined, but no eggs were found in or beneath the bark. The bark was thereupon gently stripped off, washed in distilled water, and the washings centrifuged. Beef infusion plates and potato plugs were inoculated with the deposit of the centrifuge, and small clear discrete colonies appeared on the plates within three days and a brown slimy growth on the potato plugs at the end of forty-eight hours.

Ova were, however, present, beneath the bark of the diseased and felled pollard willow, and were washed, emulsified, and plated on potato plugs.

All the brown slimy growths resulting from inoculation of the cœlomic fluid, gut contents, and crushed ova of the insects turned within an average of five days to the bright canary yellow pigmentation characteristic of Bacterium Salicis Day.

It was, however, pointed out by W. J. Dowson that the organism isolated grew more rapidly than Bacterium Salicis Day, and that the original pigmentation of the colonies on potato plugs was brown instead of grey. The cultures were thereupon handed over to him, and were found to be not Bacterium Salicis Day, but a form closely allied to it, and associated with it in watermark wood.

But though attempts to implicate the willow wood wasp as a vector of watermark disease were unsuccessful, the facts gathered are of interest. The presence of a particular organism had been traced throughout the life history of the insect. It had been isolated from ova, larva, pupa, and imago in a

FIG. 1.—X-ray photograph of the metacarpal region of the right foreleg of a St. Bernard. The interosseous muscles have been sectioned and the digits spread apart to show the dorsal sesamoids.

FIG. 2.—X-ray photograph of the metacarpal region of the left foreleg of a greyhound, showing the position of the dorsal sesamoids in a living animal.

degree that leaves little doubt there is direct hereditary transmission, and since the bacillus was first isolated from the gut of an insect feeding on diseased wood felled two years previously, there would appear to be a danger of persistent transmission. It can now be realised how perilous it is not to burn trees felled because of disease, for the inquiry had also show that the bacillus could be transmitted from diseased to healthy wood.

The insect, it would appear, is a passive carrier. It was originally supposed that the brown pigmentation of the colonies appearing on autoclaved potato plugs was due to inhibition of the organism's power of growth by the insect. Bacterium Salicis Day prefers an acid medium for growth; the secretions of the hexapod salivary and digestive glands are alkaline. Filamentous forms of the bacterium had been noted in the hanging drop preparations, and these it was imagined might be a form of bacillary defence, the organism forming a plasmodium to resist a second immunity weapon of the wood wasp, the leucocytes in its cœlomic fluid. There are three types of hexapod leucocytes, but Kovalovsky states that the hymenoptera and lepidoptera have less resistance to bacterial infection than other classes.

It is interesting to consider the discovery of the transmission of a bacterial type through the life cycle of an insect in relation to the insect vectors of human and animal disease.

THE DORSAL SESAMOID OF THE DOG

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THE advent of greyhound racing has brought an added interest to the foot of the dog. Although its various problems are associated with all branches of veterinary science, it is perhaps in the field of surgery that the most interesting problems are found and already many authors have recorded their findings; McCunn, J.[1] (1931), Bateman, J. K.[2] (1937), Formston, C.[3] (1931 and 1937), *et al.* In this connection regional anatomy must play its part. The general and applied anatomy of the foot of the dog are well known and need no emphasis, but the object of this article is to draw attention to a small bone —the dorsal sesamoid of the metacarpo/tarso-phalangeal joint—in the hope that a knowledge of its presence and function may prove of some assistance both to the surgeon and the physician.

It is a three-sided short bone. The anterior or dorsal surface is straight and embedded in, or attached to, the extensor pedis (extensor digitorum communis) tendon. In the hind limb it may be associated with the tendons of

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other muscles. The upper surface bears a small concave facet covered by articular cartilage for articulation with the most anterior area of the lower articular surface of the metacarpal/tarsal bone, but has an elevated rim so that it appears straight when viewed laterally as in the diagrams. The lower surface is slightly convex and adherent to the joint capsule. Fig. 1 shows the position of this bone and indicates its relation both to the skin and to the other interosseous structures as seen by X-ray. Note the comparative size of this sesamoid with the volar or posterior sesamoid, and also that it is nearer to the metacarpal bone than the first phalanx, sometimes more so than in others. In this photograph, which is the right fore leg of a St. Bernard, the interosseous muscles of the metacarpal region were sectioned after death in order to give a better view of the sesamoid. The view as seen in the living animal is represented in Fig. 2.

The possible clinical significance of this sesamoid is that, as it is a component part of the metacarpo/tarso-phalangeal joint capsule, and is also embedded in, or attached to, the tendon of the extensor pedis, any abnormality of this bone may be associated with, or even the direct cause of, a pathological process in these two structures.

Only one case of this nature has been encountered by the author and this was reported by Mackenzie.[4] A greyhound, which had been lame for some time, exhibited an enlarged metacarpo-phalangeal joint on the second digit of the left fore leg. Palpation revealed a distended joint cavity and excessive movement of the dorsal sesamoid. A slight downward displacement of this bone was noticed on X-ray (see Fig. 2). It was decided to remove the sesamoid. Under local anæsthesia a longitudinal incision was made over and parallel with the extensor pedis tendon. The tendon was then divided in the mid-line and the sesamoid exposed and removed. In the process of removal the joint cavity was opened. The skin wound was then sutured with fairly tight close sutures. No record of the future progress of the wound, or of the dog, were given. Bateman[5] says that he has removed this sesamoid on several occasions in cases of permanent distension of the joint capsule. In his opinion this condition occurs mainly in the third digit and usually in the fore leg.

I am indebted to Mr. H. J. Ede for the X-ray of Fig. 1 and to Mr. J. K. Bateman, M.R.C.V.S., for permission to reproduce Fig. 2.

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MASTITIS IN DAIRY HERDS

[*Contributed*]
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In countries in which the dairying industry is carried out to any considerable extent, the incidence of mastitis in the herds has given concern to the farming community and therefore to the veterinary profession. Much intensive research work has been carried out within recent years, and as far as this country is concerned, thanks to the work of Minett and his colleagues Stableforth and S. J. Edwards, we are now possessors of much information on the subject. They have shown very clearly the various causes of the disease and have evolved methods of control in which the veterinary practitioner and the laboratory worker each has his part to play.

It was in 1929[1] that these three authors first recorded the results of their analysis of the microbial flora associated with mastitis. They showed that the prevalent organism is a streptococcus, though in some cases staphylococci, B. pyogenes, gram negative coliform bacteria and certain anaerobes, especially B. necrosis, play important parts. Since the appearance of that article the progress made by these workers has been rapid and practically every year has seen the publication of one or more articles dealing with their findings.

The present position is that different types of mastitis are recognised, varying from the form of such an acute nature that actual death often results to the much more common chronic variety, which is the most prevalent and which lends itself to comparatively simple methods of control.

The four main types of mastitis may be summarised as follows:

(a) *Mastitis caused by Streptococcus agalactiæ.*

The disease is chronic and affects many milking cows throughout the country. It may be present in one or more quarters and may exist without clinical changes having taken place in the udder or the milk. As time goes on, however, changes are found in the milk in which small clots appear—usually in the fore-milk, and later, induration of the gland becomes obvious. As a general rule the changes are observed in the milk of cows well on in their lactation period and they may even be drying off. In some cases the infection progresses to such a degree that one or more quarters may be lost entirely. The result of this infection is unlike others, in that the affected cow seldom shows constitutional disturbance; the damage to the udder, however, is followed by loss of milk yield. It is this type of mastitis which yields to the control measures worked out by Minett and his colleagues. It has been estimated by Stableforth[2] that the average incidence of this form of mastitis may be put at not less than 20 per cent., the animals being affected on the average in two quarters, and further, that the proportion of infected cows

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which show severe symptoms at any given time may be 25 per cent. or more, but is usually small. Again, as a conservative estimate, he assesses the gross annual loss to the farming community caused by lowered milk yield alone at one million pounds. O'Dea[3] states that in Ireland the annual disposal of animals from dairy herds because of udder disease is 17.7 per cent. He also records that in some herds over 60 per cent. of milch cows may be affected with mastitis due to Str. agalactiæ.

(b) *Mastitis caused by other forms of streptococci.*

The various streptococci associated with mastitis have been grouped and it has been found that while the bulk fall into one group (referred to as Group I and named Streptococcus agalactiæ), other streptococci (Groups II and III) are also responsible for the occurrence of the disease. There is, however, much clinical difference between the types of the disease set up by them.

As already stated, Group I streptococci (Str. agalactiæ) give rise to a chronic infection; those of Groups II and III, on the other hand, are associated with an acute type of disease in which early changes take place in the udder and the milk. There may be no marked constitutional symptoms. The milk yield suddenly drops and the affected quarter becomes tense and painful. The local symptoms may pass off within a short space of time, but they usually recur within one or two days and again, within a few more days, the affected quarter may be entirely lost.

Still other varieties of streptococci may give rise to mastitis—the so-called type C (Lancefield) group, i.e., the type referred to as the " animal pyogenes," and the human type, Str. pyogenes or type A (Lancefield) group. In infection by the former group the disease is serious in character, though of rare occurrence, while the latter cause is generally associated with the human carrier (e.g., sore throat, scarlatina) who actually infects the cow, usually during the milking operation. The resulting disease is usually severe.

(c) *Mastitis due to Corynebacterium pyogenes.*

This type is the so-called " Summer Mastitis," being usually found affecting heifers or dry cows at grass, though it may also be met in milking animals. The characteristic finding in this form of mastitis is the occurrence of suppuration of the udder with the production of foul-smelling, greenish or blood-stained purulent secretion from the udder. The symptoms are well known to veterinary practitioners.

(d) *Mastitis due to Staphylococci.*

When staphylococci give rise to changes in the udder, symptoms of acute disease occur and often actual gangrene and sloughing of the udder may be

found. It is now realised that some types of staphylococci produce toxins and that, following mastitis from staphylococcus infection, deaths in affected cows are actually caused by toxæmia.

Other forms of mastitis are known to occur, but the above four types appear to be the most common, and of them the most important, because of its insidious character, is that due to Str. agalactiæ.

Veterinary practitioners naturally have their own methods of treatment of the more acute types of mastitis. It is with the chronic Str. agalactiæ type that this note is mainly concerned.

The recognition of the presence of this type of infection of the udder should not present much difficulty. The important features pointing to its existence are summarised by Edwards.[5] The method he suggests consists of operations which can be used on the farm and those which are carried out in the laboratory.

Examination on the Farm

The following information and examinations are of importance: (i) History of the cow—abnormalities such as clots in the milk at any time, swelling of the udder, reduction in milk yield, unassociated with other causes, are taken as indicative of infection. (ii) Inspection of the milk—the presence of yellowish clots or a pronounced watery appearance is noted. The use of a shallow dish (cup) with a blackened surface is made. Into it is drawn the fore-milk from each quarter. Even the presence of one or two clots from one quarter is of importance in diagnosing the existence of the disease. (iii) Reaction of the milk—brom-cresol-purple papers may be used for this purpose. An abnormally alkaline milk (indicating infection) produces a purplish tint compared with the yellowish-green colour produced by normal milk. (Edwards gives a useful hint that, as a guide to the normal colour, the milk of a first-class heifer may be tested.) Concerning the brom-thymol-blue test, Palmer, Kakavas and Hay[4] report that the use of this substance in testing milk failed to indicate mastitis in 29.34 per cent. of milk samples from individual quarters which were positive by bacteriological examination.

It follows, from the above brief description, that the preliminary examination of milk from suspected infected cows is a fairly simple procedure—an operation which the veterinary practitioner can very readily carry out, but the results may not be accurate.

In order to control chronic mastitis, caused by Str. agalactiæ, the veterinary practitioner must obtain the assistance of the laboratory, for there are limitations to the extent to which the methods of diagnosis carried out on the farm can be used. Many cows in various stages of infection may be missed. Edwards[5] showed that even when a combination of the various tests, apart from culture work, was used the incidence of infection detected was only 41 per cent.

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Control in the Herd

Having undertaken to control the infection in a herd, the following is the general scheme recommended by the above workers.

Quoting from a paper by Stableforth *et al*:[6] "Eradication of contagious streptococcus mastitis may be achieved under certain conditions by the simple expedient of segregating infected cows or, if that is not possible, by milking them last. The chances of success, however, are greatly increased if infected cows can be evacuated within a reasonable time. When this cannot be done, infusion of the infected udder with a suitable bactericidial agent should prove a useful aid. . . . Experience has shown that the disease does not arise sporadically once all known sources of infection are removed. New infections must, therefore, be due to errors in milking or to deficiencies in methods of diagnosis. The formation where possible of a separate heifer herd is a measure of the greatest value."

That, in a nutshell, explains the general outline of control.

(a) *The detection of infected animals.* The following is the method recommended by Edwards.[7]

The testing of samples of milk from all the cows and heifers in the herd must be carried out. This is referred to as the *First Test.* Twenty c.c. mixed sample of milk from the four quarters of each cow should be taken at the evening milking into tubes containing 1 c.c. mixture of equal parts of sodium azide solution 1 in 500 and brom-cresol-purple solution 0.1 per cent. The final concentration of sodium azide will thus be 1 in 20,000. The samples can be kept at room temperature till the next day when the various reactions are read. Then 0.01 c.c. gravity cream is inoculated by a wire loop into a plate and the same amount into a selective liquid medium. Into the plate a little saline solution is introduced to emulsify the cream. About 10 c.c. crystal violet-asculin-blood agar are added to the plate and the plate is then well shaken. The plates and the broth are examined after 48 hours' incubation. Beta-hæmolytic streptococci are easily detected. The animals in whose milk the streptococci are found are then isolated as above.

The *next test* is carried out in two months' time. On this occasion a more thorough examination is carried out on the cattle found healthy at the previous test. Quarter samples are examined. The milk from each quarter is drawn into a tube, 11 x 3 c.m., sodium azide and brom-cresol-purple having already been added. 0.01 c.c. of the gravity cream from each tube is carefully sown into liquid selective medium and the growth is noted after 48 hours' incubation. Str. agalactiæ grow in the form of heavy, flocculent deposits with a complete clearing of the supernatant fluid. The culture can be identified by its action on methylene blue milk (1 in 20,000) and by its ability to ferment

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mannite and salicin. Plating on blood agar may be carried out in the case of doubtful cultures. Subsequent tests are carried out on the clean cattle at intervals of 3-6 months.

(b) *The preservation of the clean herd.*

Having established a clean herd or part of a herd, precautions are necessary to maintain its freedom from infection. If the affected animals are in a separate shed, the risk of spreading infection from them is greatly minimised. It must always be borne in mind that the infection is conveyed to healthy from infected animals from their milk. Washing of hands, the use of clean cloths to wipe the udder and teats, the treatment of wounds on the teats, etc., the adequate sterilisation of milking cups of milking machines, etc., are all precautions which can be taken to minimise the risk of infection. If the infected cows are in the same shed as the clean cattle, the latter should be milked first unless separate milkers can be available for each of the groups. Heifers should always be milked first. Newly purchased or introduced cows or heifers should be placed in isolation till an examination of their milk is made and found free from infection. Notwithstanding the fact that the milk of such an animal may be found clean, the cow should still be regarded with some suspicion till the *next test* has been carried out in the herd, when its milk should be included for testing.

Minett[8] has just published a short paper in connection with a small herd of milking cows in which he carried out the recognised control measures. The herd had been self-contained since 1932 and when milk samples were examined first in 1936, three of the 18 milking cows were found to have the steptococcus in their milk. The three cows were eliminated from the herd and many tests have been made of milk samples from the remainder. Out of 29 animals in the herd during the period under observation (two years), 22 were found to be infected at one time or another, some very slightly which would have been missed had no cultural work been carried out. He found that infection was more regularly found in the latter period of lactation and that in an individual cow, the same quarter was not found to be infected at each test. From the results on this farm Minett wonders if the view is generally correct, that, by a series of cultural examinations applied to milk of individual cows it is possible to eradicate the disease relatively easily or quickly. He points out, however, that this finding does not imply that control measures based on such examinations should be discarded, but that the chief object should be to form a herd in which the number of clinically evident infections remains insignificant. To accomplish this object he suggests: (1) periodic cultural examinations of milk samples to demonstrate latent infections; (2) avoidance of environmental influences which may lower the animal's resistance or interfere with the activity of the udder, e.g., incomplete milking, injuries to the teats, etc.; (3) control of calfhood infection.

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(c) *The treatment of affected animals.*

It is seldom that an affected cow becomes entirely free from infection. The degree of infection seems to vary from time to time and on occasion there may be no evidence of streptococci. Bryan, Moore and Campbell[9] have shown recently that the presence of streptococci in the milk is associated with streptococcic infection of the udder tissue. This finding supports the argument that once infected, the cow remains in an infected condition, though in a latent state.

Vaccination with autogenous or stock polyvalent vaccines has been practised widely and, in some cases, successful results have been recorded. It is somewhat difficult to assess the value of any form of vaccination for the control of Str. agalactiæ infection. In all probability the results, even in the most favourable instances, may only be palliative in character—a permanent cure being seldom obtained. (The use of a "toxoid" in the control of B. pyogenes infection [Summer Mastitis] may, however, be of considerable value.)

Injection of the udder with certain chemical substances may be practised with the chance of success. Stableforth[2] refers to entozon (1 in 1,250) and acriflavin (1 in 10,000) and states that in latent cases and in clinical cases in the early stages, 60 to 80 per cent. of infected quarters are cured by two treatments, but in old-standing infections only 30 per cent. yielded to the treatment. He explains this low figure as being due to the destruction of the udder tissue being so extensive that a return to normal function could not be expected. Gerstner[10] records his experiences with entozon and trypaflavin. He used these drugs in both dry and lactating cows. For dry cows entozon was used in a watery solution of 1 in 1,000 and for lactating cows, 1 in 1,250. The trypaflavin was used in a strength of 1 in 2,000 to 1 in 20,000 for slight infections. He injected from 500 to 1,400 c.c. into the affected quarter, i.e., till the udder was at full milking tension. In lactating cows the solution was left in the udder for three minutes and in dry cows for 9 to 24 hours before milking out. He found trypaflavin more successful than entozon. Of 76 treated cows he claims to have cured 74.

Chemotherapy has been tried by various workers. Sulphanilamide *per os* is referred to by Stableforth[2] in the following terms: "The probable result appears to be that whereas sulphanilamide, when given in doses which produce a high concentration in the milk, is often followed by a spectacular improvement in the character of the secretion, it does not get rid of the infection. The clinical result has, in many cases, been quite striking and suggests that its use may be of value in acute cases. Complete sterilisation of the infection seems, however, to be an infrequent result." More recently, Little[11] records his observations in five cows treated with sulphanilamide. He gave 108 to 1,361 grams per cow. The drug failed to destroy the streptococci in the affected quarters, though, during treatment, the number of streptococci and leucocytes appearing in the milk were greatly reduced. In acute mastitis the daily ad-

ministration of the drug may aid in alleviating the acute symptoms, but repeated attacks may be expected to occur, since the development of the streptococci is only temporarily retarded.

The above is a brief summary of the position of the results of research into mastitis in cattle. It will be realised that there is much scope for the control, especially of the chronic type due to infection by Str. agalactiæ, by the collaboration of the veterinary practitioner and the laboratory worker.

The suggestions outlined above aim at the *complete* control of mastitis caused by Str. agalactiæ. Where laboratory facilities are absent or can only be used to a limited extent, the practice of good dairy hygiene and management of the herd together with the isolation of clinically affected cases will assist materially in preventing the spread of the infection.

At the present time when efforts are being made to guard the milk supply throughout the country, it behoves the veterinary profession to take the necessary measures to ensure that any condition which lends itself to control should be dealt with to the fullest extent.

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Abstracts of Current Literature

Phenothiazine for the Removal of Heterakis Gallinæ from Chickens. By Ernest C. McCulloch and Lyle G. Nicholson. *Vet. Med.* (1940), *XXXV,* 398.

THERE has been a considerable number of articles from various countries describing the successful use of phenothiazine in the treatment of roundworm infestations in different animals. This article describes its use in chickens. The following is the summary:

Heterakis gallinæ is a common parasite of chickens that serves as a vector for *Histomonas meleagridis*, the causative organism of enterohepatitis. In addition large infestations cause severe typhlitis.

Heretofore, no entirely satisfactory anthelmintic for this parasite has been reported. Those previously recommended either are difficult to administer or are low in effectiveness.

Phenothiazine was administered to S.C. White Leghorn chickens suffering from a natural heavy infestation of cecal worms. This drug was given either in the feed or in hard gelatine capsules. Single and repeated doses were tried.

Between 0.05 and 0.5 grams was found to be a satisfactory individual dose.

Repeated doses and administration of the drug in individual capsules were found to be slightly more satisfactory, although flock medication appears to be practical.

The average effectiveness was between 95 and 100 per cent., both from the standpoint of cecal worms expelled and killed.

Enormous doses, up to 500 times the smallest amount therapeutically effective, had no apparent harmful effect on the birds; such massive doses also had no anti-heterakid effect.

Individual capsule medication of 0.5 gm. had no appreciable effect on a flock in egg production.

Neither massive nor therapeutic doses had any effect upon the flavour of the meat.

The administration of phenothiazine was not followed by enteritis or other digestive disturbances, except for a slight softening of the feces 24 hours following treatment.

The use of phenothiazine as an anthelmintic for the removal of heterakids is recommended, even though the most desirable dosage had not been definitely determined.

A Little Hygienic Advice Respecting the Slaughtering of Large Cattle. By H. Malmsten. *Skand. Veterinärtskt.* (1940), *XXX*, 368. (Author's Summary in English.)

BEFORE the head is separated from the trunk, about 20 cm. of the cervical portion of the gullet should be isolated and a powerful clamp, with a locking device, should be fixed around the gullet and locked fast. After this, the gullet should be cut through close to the head. As the gullet is held closed by the clamp, no stomach contents can run out to pollute the meat of the neck.

When the carcass has been hung up so as to hang freely the clamp is

removed, whereupon the contents of the stomach are evacuated on the floor of the slaughterhouse, when they can easily be removed.

By this way of evacuatng the contents of the stomach, the stomach and intestines escape pollution when they are removed.

If the meat is to be sluiced with water, this must be done by a hose with water direct from the main and not with water from insufficiently cleaned buckets, etc.

The udder with uninjured teats should be separated from the carcass in one piece.

When the traditional slaughtering is employed the teats usually accompany the hide, and the meat becomes polluted by the milk which is frequently morbidly altered.

Treatment of Coccidiosis in Calves with Silver and Copper Oxides. By John D. Beck, V.M.D., University of Pennsylvania, Philadelphia, Pa. (Reprinted from the *North American Veterinarian* (1940), *21*, 404.)

THIS is a preliminary report on the use of a preparation of colloidally dispersed silver and copper oxides in the treatment of coccidial enteritis in calves.

Bovine coccidiosis manifests itself chiefly as a hæmorrhagic enteritis of calves, affecting the large intestine. The onset is sudden and the course averages from five to ten days. According to Hutyra and Marek, the mortality in North America is 30 to 50 per cent.

Dr. Wm. J. Lentz reported verbally on good results obtained with the above preparation in the treatment of canine coccidiosis and suggested that it might have value in the treatment of this condition in other species. Not long thereafter an opportunity presented itself to try this treatment on cases encountered in the University of Pennsylvania Ambulatory Clinic.

A commercial preparation of the silver and copper oxides (Novoxil with copper-Squibb), which is marketed in the form of an ointment, containing 5 per cent. silver oxide and 2 per cent. copper oxide, was administered in 1½ dram doses three times a day for a period of three days. Seven calves were treated, three in one herd and four in another; all recovered.

In former outbreaks of the disease observed in our clinic, the symptoms were no more intense than in the cases just cited and from one to three of the first animals to be affected died. A comparison of these results with recovery in all cases so far treated with silver and copper oxides leads one to conclude that the agent has been of some value.

In the absence of controlled experiments and considering that coccidiosis is a self-limiting disease, it is difficult to appraise the value of therapeutic agents used in its treatment. It is hoped that such experiments will be undertaken in the near future.

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Studies on the Intradermal Method of Vaccination against Equine Encephalomyelitis. By H. W. Schoening, M. S. Shahan, O. L. Osteen and L. T. Giltner. *Vet. Med.* (1940), XXXV, 377.

THERE had been occasional reports of "disquieting reactions" following the vaccination of horses in 1938 with two doses of equine encephalomyelitis chick embryo vaccine. The vaccine had been injected subcutaneously. In an attempt to minimise the reactions the intradermal method of vaccination was studied with the following results:

(1) The intradermal injection of guinea-pigs of regular, commercially prepared, chick embryo equine encephalomyelitis vaccine produced at least as good, if not better, immunity than when the same vaccine in the same amounts was injected subcutaneously.

(2) Vaccine injected intradermally in various amounts in horses produced a better immunity than the same vaccine in similar amounts when injected subcutaneously.

(3) In horses the immunity produced by intradermal injection of vaccine in two 1 c.c. doses was as good as that produced by two 10 c.c. doses subcutaneously.

(4) Vaccines reported to have caused severe, undesirable reactions in horses in the spring of 1940, when injected into 20 horses intradermally, produced very little local reaction, while the same vaccine injected subcutaneously or intramuscularly in 20 horses produced in some of the animals rather marked, extensive swellings at the site of injection. The greater number of these untoward reactions appeared in horses which had been vaccinated in 1939.

Tuberculin Reactions in Cattle due to Infection with the Human Type of the Tubercle Bacillus. By F. W. Nielsen and N. Plum. *Skan. Veterinärtskt.*, 1940, XXX, 245.

IN this article there appear a number of references to the occurrence of tuberculosis in cattle associated with infection from human beings. The authors are of opinion that infection with the human type of tubercle bacillus is the cause of some of the positive reactions to tuberculin in herds of cattle in which apparent "breakdowns" occur. When unexpected positive reactions are found in "clean" herds at a routine test, it is their custom to apply two tuberculin tests—bovine and avian—soon after the original test. By adopting this method a number of the "breakdowns" can be explained. In some cases, however, a differentiation between the types of reactions from these two tuberculins cannot be established and when this occurs the subcutaneous tuberculin test is carried out in the entire herd. It is found that there may be much disagreement between the results of intradermal and the subcutaneous test and this finding is said to be confirmation of infection by the human type. Most of the evidence produced in the article is presumptive, e.g., in one herd in

which slight reactions to bovine tuberculin were obtained it was found that the cowman suffered from pulmonary tuberculosis. Of 86 animals in the herd 55.1 per cent. showed a positive reaction. The cowman was removed from the herd and in a year none of the cattle reacted to tuberculin. In no instance among the cattle presumably infected with the human type of bacilli was there evidence of secretion of the organisms in the milk.

Reviews

Diseases of the Pig and its Husbandry. By DAVID J. ANTHONY, M.R.C.V.S., D.V.S.M. Pp. xii, 272. 48 Illustrations. London: Baillière, Tindall and Cox. Price 10s. 6d.

THIS textbook will be read by veterinary surgeons and others in this country and elsewhere in the knowledge that it has been written by one well versed in the subject. We have read it with much satisfaction for it fills an important place in our veterinary literature. Throughout the whole volume there are clear indications of the first-hand knowledge possessed by the author and the book has been written in such a style that it is easy to grasp the various subjects dealt with. The free style can possibly be explained by the object which the author had in view, viz.: "This work has been written in the hope that it will fill a gap in our veterinary literature, and that it will not only be of some use to veterinary surgeons and students, but to all who are interested in that most useful animal, the pig, from the agriculturist, the large-scale breeder, to the cottager and the enthusiastic amateur anxious to try his hand and to help his country by keeping a pig or two at the bottom of his garden." All these objects have been accomplished, for though in some places the scientific language and technical expressions may seem beyond the grasp of the "amateurs," there is much that cannot fail to interest and be of value to those whose acquaintance with such terms is meagre.

The book may be divided into several main sections:

(a) *General Considerations.* (Chapters 1 to 5).—Included in this section are many useful points, such as breeds, breeding and breeding requirements for the pork market and the bacon trade, housing, feeding, etc. Much of the matter is up to date and will prove useful to all readers. Most of us have had some difficulty in knowing exactly where to look for some of this general information, e.g., the relationship of live and dressed weights, the standard growth rate of pigs, the ageing of pigs (a very useful table of tooth eruptions is given on p. 161), etc. War-time methods have not been omitted, e.g., the

Lehmann method of pig feeding is described. (Incidentally, one wonders why Chapter V, headed "Dentition and Ageing," should include such subjects as respiration, signs of health and restraint. It might have been better to have included them in a special chapter.)

(b) *The Scheduled Diseases* (Chapter VI).—There are given in this section full accounts of anthrax, foot-and-mouth disease, swine fever and rabies. Much of the known features of these diseases is discussed, but, in addition, there are found records of personal observations of much value, e.g., concerning swine fever, it is stated on p. 75 that "Petechial hæmorrhages are often found in the kidneys and in the skin, these latter being often missed owing to bristles and dirt in a farm pig dead of the disease. In some cases the skin lesions take the form of patchy subcutaneous hæmorrhages, which are only visible in an abattoir carcass. . . . The soaking of patches of the skin with boiling water and scraping away the bristles and superficial layers of the epidermis will often reveal the petechial hæmorrhages in the skin when they would otherwise be missed entirely." On the same page some very sound advice is given in the following terms: "It is, of course, not possible to arrive at a correct diagnosis of any disease unless one takes into consideration all the symptoms and, in the case of swine fever especially, all the post-mortem lesions as well."

(c) *Constitutional Diseases* (*Non-scheduled*) (Chapter VII).—Here we find described such conditions as tuberculosis, Aujeszky's disease, actinomycosis, actinobacillosis, swine pox, pig paratyphoid, swine erysipelas, swine influenza, piglet influenza, rheumatism, tetanus, contagious abortion and some protozoal diseases. The author shows his wide knowledge of most of the conditions and quotes freely from the literature concerning them. It is interesting to note that in the treatment of piglet influenza the author states that "In view of the similarity of some of the symptoms and lesions found in influenza and of those found in avitaminotic conditions, treatment to diet and general hygiene may give better results than attempts at immunisation." This statement is evidence of our general lack of exact knowledge concerning some of the diseases affecting the pig.

(d) *Deficiency Diseases* (Chapter VIII).—This is a compact description of the available knowledge concerning diseases arising from errors in diet. As the author wisely points out, actual disease may not be set up by such deficiencies but rather a train of symptoms. Our knowledge of this subject is by no means complete.

(e) *Local Diseases* (Chapters IX to XII).—In this section the various diseases are arranged according to the set of organs or tissues involved, e.g., parts deal with diseases affecting the alimentary tract, the circulation, the nervous system, etc. Many of the conditions are described more as general diseases as they occur in other animals and not necessarily as they are found

in the pig. Concerning some, however, special mention is made of their occurrence in pigs and their association with general disease complexes.

(f) *Diseases caused by Animal Parasites* (Chapter XIII).—This section deals with both external and internal parasites and is a very fair account of their relationship to the host and of the occurrence of disease conditions produced by them. The chapter includes methods of demonstrating parasites and their eggs.

(g) *Poisons and Poisonous Plants* (Chapter XIV).—In this final chapter is accumulated a large amount of valuable information.

The textbook is well illustrated and the production is of the high standard we have come to expect from the publishers.

A few errors have crept in here and there: doubtless they will be corrected in the next edition.

We can confidently recommend this work to the veterinary profession.

The Story of the Dog and his Uses to Mankind (1940). By CECIL G. TREW. Published by Methuen and Co., Ltd., London. Price 8s. 6d. net.

THE author of this interesting book certainly knows his subject. He has carried out a research into the history of the dog, tracing his ancestry from early times through the ages. His stories of the fidelity of dogs to their human master clearly show that not only to-day, but throughout its history, the dog has recognised its allegiance to the human race. The various uses to which dogs have been put at different times makes instructive reading and not the least interesting chapter is that entitled "Dog and the Supernatural." There is an excellent bibliography, the extent of which confirms the view that no effort has been spared in searching for the necessary matter in the compilation of the book. The volume is well illustrated and the 16 plates are excellently reproduced. It is of interest to note that the author in his research made use of the Library of the Royal College of Veterinary Surgeons. To those interested in the dog, its history and its associations with the human race, we can recommend this work.

Mammalian Genetics (1940). By WILLIAM E. CASTLE, Professor Emeritus of Genetics, Harvard University Research Associate in Genetics, University of California. Published by Humphrey Milford. London: Oxford University Press. Price 11s. 6d.

PROFESSOR CASTLE has prepared an excellent summary of the present knowledge of the genetics of mammals. In this book of 19 chapters there is given a clear and concise description of the many facts and theories of the subject. It should form an excellent guide to students of the subject, and to those who desire a general knowledge of genetics, this work will be very

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acceptable. It is assumed that the reader has a working knowledge of anatomy and physiology, including the principles of embryology. The arrangement of the subject matter is good and the drawings add much to a clear understanding of the subjects under discussion. For students carrying out laboratory work on the subject there is provided a " Manual for a Laboratory Course in Genetics " to accompany the textbook, at a cost of 3s.

The publishers are to be congratulated on their production of the volume.

Personal

LT.-COL. A. A. COMERFORD, D.S.O., M.R.C.V.S.

We extend our hearty congratulations to Lt.-Col. A. A. Comerford on his being awarded the D.S.O. for conspicuous service with the B.E.F. Lt.-Col. Comerford was in command of the 52nd Bedfordshire Yeomanry Heavy Regiment (R.A.). His home is at Potton, Beds, where he carried on an extensive practice before the outbreak of war.

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